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ORIGINAL PAPER

Suicidality in the prospective Zurich study: prevalence, risk factors and gender

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Abstract Our prospective Zurich study (1978–2008) found that suicidal ideation had occurred in 40.5 % and suicide attempts in 6.6 % of the population by age 50. Important gender differences were found in both suicidality and its risk factors. Suicide attempts were earlier and more frequent among women than among men: 70 versus 44 % reported their first suicide attempt before 20. For women, the relative risk of suicide attempts was 1.6, but the relative risk of suicidal ideation was about equal (1.1 for women). The main risk factors for suicidal ideation in women were low social support (OR 4.0) and frequent punishment in childhood (OR 3.7), and in men, a depressive (OR 6.5) and an anxious personality (OR 4.6). The main risk factors for suicide attempts in women were a broken home (OR 10.2) and sexual abuse/violence (OR 7.9) in childhood; in men, no multivariate analyses of suicide attempt were conducted because of insufficient statistical power.

Keywords Suicide attempts · Suicidal ideation · Risk factors · Gender · Epidemiology

Introduction

The prevalence, risk factors and gender differences in regard to suicidality have been extensively researched. The gender differences are considerable: it is well established that prevalence rates for suicide attempts in women are twice as high as in men [1], whereas the reverse is true for the prevalence of completed suicides in many countries [2,

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3]. The exception is China, where as many women as men die by suicide [4]. In addition, some risk factors for suicidality are gender distinctive while some are not [5].

In the longitudinal sample ($N = 593$) of the Zurich Adolescent Psychology and Psychopathology Study (ZAPPS), the intra-individual stability of suicidal risks throughout adolescence was significantly higher than expected. At all three times of assessment, from preadolescence to young adulthood, there was a clear excess of abnormal psychosocial findings in the suicidal risk groups as compared to the matched controls.

Moreover, suicidal risk in preadolescence irrespective of behavioural and emotional disorders [6] was found to predict various psychiatric disorders in young adulthood. Correspondingly, it has also been shown that both transient and enduring suicidality in adolescence have an impact on young adult psychopathology [7].

Many risk factors for suicidal ideation and attempts have been found: in the first Netherlands Mental Health Survey and Incidence Study (NEMESIS) among subjects with depressive spectrum disorders, correlates of suicidality were living alone, younger age (25–34 years), duration of depression, anhedonia, feeling worthless, comorbid anxiety and previous suicidality [8]. In a second study (NEMESIS-2), risk factors for suicidal behaviours were being female, younger and less well educated, and having had childhood trauma and a prior mental disorder [9].

Using the data from a population sample followed prospectively for 30 years (from the ages of 19/20 to 49/50), this paper seeks to characterise (a) subjects who attempted suicide, (b) those who had suicidal ideation/plans and (c) controls. It will also analyse the risk factors for suicidal behaviours by gender.

Methods

Sampling and procedure

The Zurich study comprised a cohort of 4,547 subjects ($m = 2{,}201$; $f = 2{,}346$) representative of the canton of Zurich in Switzerland, who were screened in 1978 with the Symptom Checklist 90-R [10], when the men were 19 and the women 20 years old. In order to increase the probability of the development of psychiatric syndromes, a stratified subsample of 591 participants (292 men, 299 women) was selected for interview, with two-thirds consisting of high scorers (defined by the 85th percentile or more of the global severity index (GSI) of the SCL-90-R) and one-third being a random sample of subjects with scores below the 85th percentile of the GSI. A detailed description of the sampling method has been provided elsewhere [11]. Such a two-phase procedure, i.e. initial screening and subsequent interview with a stratified subsample, is fairly common in epidemiological research [12]. Altogether, seven interview waves have been conducted: in 1979 ($N = 591$), 1981 ($N = 456$), 1986 ($N = 457$), 1988 ($N = 424$), 1993 ($N = 407$), 1999 ($N = 367$) and 2008 ($N = 335$). The initial allocation to the two groups above and below the 85th percentile of the GSI remained stable throughout the study; the dropouts were more frequent among the extremely high and extremely low GSI scorers [13]. We repeated the dropout analyses at the latest interview (2008), when we found, in addition, no significant difference between subjects who had left the study and those who remained in regard to socio-economic status and education as measured at the study outset, nor in their initial psychopathological impairment according to the nine SCL-90-R subscales. However, there was a moderate gender bias, with more dropouts being men (OR 1.82; 95 % CI 1.31–2.53; $p < 0.001$).

Instrument and measures

Interviews were conducted with the "Structured Psychopathological Interview and Rating of the Social Consequences of Psychological Disturbances for Epidemiology" (SPIKE) [14]. This semi-structured interview was specifically developed for epidemiological surveys in psychiatric research; it collects data on socio-demography, somatic syndromes, psychopathology, substance use, medication, health services, impairment and social activity. Its reliability and validity have been reported previously [15].

The SPIKE interview assessed suicidal symptoms over the past year, not only within the interview section on depression but also separately as one of the many other somatic and psychiatric syndromes. Suicidal symptoms were identified by the broad entry question: during the past 12 months: did you ever feel that you wouldn't care if you were dead, or did you have intentions to harm yourself? Did you wish you were dead, have vague and/or serious suicidal thoughts; did you make a suicide attempt? If the answer to this screening question was yes, five stages were evaluated: (1) I wouldn't care if I were dead or didn't have to live any longer, (2) vague, transient thoughts of ending life, (3) persistent, serious thoughts of ending life, (4) precise plans of how to end life and (5) suicide attempt. In addition, data on the frequency and duration of suicidal symptoms and certain details (imagined method of suicide, etc.) were collected. The suicidal symptom from the Symptom Checklist (SCL-90 R) [10]: item 15, thoughts of ending your life, was added. In addition, lifetime suicide attempts were recorded at each of the seven interviews.

We grouped suicidal symptoms as follows: (1) none, (2) suicidal ideation and (3) suicide attempt. Unfortunately, data on completed suicides which may have occurred

during the study were not available for legal reasons. In the 1980s, Swiss personal data protection regulations required the deletion of all identification data of study participants who so requested; the very substantial loss of information precluded any subsequent collection of mortality data.

Socio-demographic variables comprised father's profession, parents' income, subject's level of education, social support (assessed at age 19/20), marital status and receipt of social benefits. A mean composite score for social support made up of the items "social isolation", "need for emotional warmth" and "number of close friends" was computed for all interview years. Childhood problems and different personality types (depressive, anxious and cyclothymic) were assessed by direct questions and by the General Behaviour Inventory (GBI) [16]. The data on problems during childhood were collected retrospectively twice, when the subjects were 27/28 and 29/30 years old; two scales (family problems and conduct problems) were constructed by an exploratory factor analysis [17].

To examine different coping strategies, at the age of 20/21, we incorporated the established scales of mastery and self-esteem of Pearlin and Schooler [18]. Mastery describes the extent to which a subject is convinced they have control and influence over personal life events and problems (e.g. "I have little control over the things that happen to me"). Self-esteem measures a subject's self-confidence and positive attitude towards themselves (e.g. "I feel that I have a number of good qualities"). The mastery subscale consists of 7 items and the self-esteem subscale of 6. All questions were rated on a four-point Likert scale, ranging from 1 "completely agree" to 4 "completely disagree". The reliability and validity of the two subscales have been reported to be good [19, 20].

At the age of 29/30, we examined the participants' personalities, using the Freiburger Persönlichkeits-Inventar (FPI) [21]. The FPI, a widely used German personality inventory, depicts personality traits on nine distinct scales. Those subordinate traits are (1) nervousness, (2) irritability, (3) depressiveness, (4) impulsivity, (5) sociability, (6) resilience, (7) dominance, (8) inhibition and (9) openness. Those traits map on to the three superordinate traits aggression, extraversion and neuroticism. The FPI has shown good reliability and validity [21].

Statistical analysis

The prevalence rates of suicidality were weighted to adjust for the sample stratification, by applying the SURVEYFRQ command of SAS version 9 for Windows. This procedure uses probability weights to compute frequencies and unbiased standard errors. We thus obtained estimates representative for the Canton of Zurich, Switzerland. Gender differences in weighted prevalence rates were analysed with Wald χ^2 tests. All other bivariate analyses were carried out with unweighted data in order to avoid a bias due to the large weighting factor. Differences in the mean values of continuous variables across the suicidality groups were analysed with Kruskal–Wallis tests, while frequencies in categorical variables were compared using χ^2 tests, using SAS 9 for Windows. Multivariate associations were conducted with SPSS version 20 for Macintosh using multinomial logistic regression analyses. Suicidality was entered as the dependent variable. Included were all predictors that yielded at least a small bivariate effect size (a priori defined as an R^2 of at least 0.03). To avoid multicollinearity between dichotomous personality types and continuous personality traits, only the former were included. The proportion of total variance explained was indicated according to Nagelkerke's pseudo-R^2. In men, no multivariate analysis of suicide attempts was conducted because of insufficient statistical power.

Results

Prevalence of suicidality

Overall, we found a lifetime prevalence rate for suicidal ideation of 40.5 % and a further 6.6 % for suicide attempts. The weighted lifetime prevalence rates of suicidal manifestations by gender did not differ significantly across the three groups (Wald $\chi^2 = 1.91$, $df = 2$, $p = 0.386$). Suicidal ideation was found to an almost identical extent in women and men (42.2 vs. 38.8 %; risk ratio = 1.1), but lifetime suicide attempts were slightly more prevalent in women (8.1 vs. 5.1 %; risk ratio = 1.6). The odds ratio for women, according to an unweighted binomial logistic regression with no symptoms as the reference, was OR 1.1 for suicidal ideation and OR 2.6 for suicide attempt.

The age at the first suicide attempt was available in 47/55 cases in women and in 18/24 cases in men; in 33/47 (70 %) of women and in 8/18 (44 %) of men, the first suicide attempt had already occurred before 20 years of age. The weighted prevalence rates of early versus later (age 20+) suicide attempts were 3.3 versus 2.6 % in women and 1.4 versus 3.2 % in men.

The annual number of subjects attempting suicide fell sharply as the age of the sample increased: before 20 ($N = 41$), at 20 ($N = 16$), at 22 ($N = 6$), at 27 ($N = 1$), at 29 ($N = 0$), at 34 ($N = 0$), at 40 ($N = 2$), at 50 ($N = 2$). At the last interview, which covered the ages 40–50, there were just five suicide attempts, only one of which was a first rather than a repeated event.

Table 1 Bivariate associations of categorical variables by gender (row %)

	Men				Women			
	No symptoms	Suicidal ideation	Suicide attempt	*p*	No symptoms	Suicidal ideation	Suicide attempt	*p*
N	111	157	24		99	145	55	
Lifetime Prevalence %	56.11	38.80	**5.09**		49.69	42.24	**8.08**	
Lifetime treatment prevalence %	–	4.5	2.7		–	**9.5**	**6.5**	
Family history of suicide (attempts)	8.1	16.6	16.7	0.12	8.1	20.7	29.0	0.003
Childhood								
Broken home	14.5	17.4	23.5	0.68	5.3	15.0	**31.9**	0.001
Frequent parental conflicts	16.1	26.9	**52.9**	0.008	17.5	30.8	**40.4**	0.04
Disliked/rejected by peers	7.0	14.9	15.0	0.25	6.8	18.7	**30.0**	0.007
More punished than peers	4.8	15.8	**29.4**	0.02	5.3	20.8	**36.2**	0.0004
Restless in class	16.9	32.1	**35.0**	0.05	15.3	23.6	24.0	0.40
Discipline problems at school	16.9	19.4	**40.0**	0.0004	5.1	6.5	**18.0**	0.03
Sexual abuse/violence	1.8	7.0	4.2	0.14	8.1	17.0	**41.8**	0.0001
Trouble with the police	18.3	16.4	30.0	0.34	3.4	2.4	12.0	0.03
Family atmosphere								
Warm	62.0	48.6	26.1		70.2	55.7	45.3	
Neutral	25.9	25.0	21.7		17.0	15.0	17.0	
Tense	12.0	26.4	**52.2**	0.001	12.8	29.3	37.7	0.007
Schooling								
Low	42.6	36.7	45.5		24.7	30.7	44.4	
Medium	31.5	38.7	27.3		37.6	37.1	37.0	
High	25.9	24.7	27.3	0.71	37.6	32.1	18.5	0.08
Living alone	14.4	22.9	25.0	0.19	13.1	28.3	21.8	0.02
Full-time working	89.0	84.7	75.0	0.24	39.0	37.2	33.3	0.83
Civil status								
Single	42.3	43.3	**37.5**		37.4	35.9	27.3	
Married	48.7	40.8	41.7		48.5	37.9	30.9	
Separated/divorced	10.8	16.6	20.8	0.36	13.1	25.5	**43.6**	0.0001
Living on benefits (at last interview)	6.0	9.9	**26.1**	0.02	5.7	6.6	13.2	0.22
Social support at age 20/21								
Low	5.4	19.1	25.0		7.1	24.1	**30.9**	
Medium	43.2	43.3	37.5		54.6	50.3	40.0	
High	51.4	37.6	37.5	0.008	38.4	25.5	29.1	0.002
Personality traits								
More anxious than peers	1.8	19.8	8.3	0.0001	5.1	16.1	16.4	0.02
Cyclothymic (GBI)	5.4	19.1	25	0.002	11.1	26.9	25.5	0.01
Depressive (GBI)	2.9	16.4	10.5	0.02	5.1	13.1	30	0.001

Risk factors for suicidality by gender (bivariate associations)

A descriptive picture of *risk factors for suicidality* separated by gender is provided by the *bivariate analyses* (see Tables 1, 2). A number of predictors were statistically significant for both men and women: these included childhood problems (parental conflicts, tense family atmosphere and conduct problems) and several personality traits (e.g. irritability, depressiveness and neuroticism). Many other risk factors were only significant for women: childhood experiences of a broken home, being disliked/

Table 2 Bivariate associations of continuous variables by gender

	Men						*p*	Women						*p*
	No symptoms		Suicidal ideation		Suicide attempt			No symptoms		Suicidal ideation		Suicide attempt		
	m	SD	*m*	SD	*m*	SD		*m*	SD	*m*	SD	*m*	SD	
Age at onset			20.6	8.6	22.9	9.1	0.41			21.0	7.8	17.9	9.1	0.002
Superordinate personality traits (FPI)														
Aggression	16.46	7.38	17.80	7.47	19.51	7.72	0.269	16.64	7.34	17.58	6.90	19.88	7.55	0.053
Extraversion	20.06	8.57	18.41	7.94	21.32	6.49	0.218	19.63	7.30	17.35	7.66	16.08	7.03	0.083
Neuroticism	13.16	5.38	16.43	6.90	17.73	8.01	0.006	14.08	6.41	17.69	6.54	21.73	7.63	0.000
Subordinate personality traits (FPI)														
Nervousness	13.94	5.14	15.64	6.58	16.71	7.61	0.265	15.47	6.07	18.31	6.42	22.24	7.89	0.000
Irritability	15.72	6.55	18.34	7.33	19.20	9.08	0.072	13.89	5.54	14.86	6.67	17.86	6.78	0.002
Depressiveness	10.16	5.27	15.46	7.71	18.69	9.39	0.000	10.36	5.68	14.54	6.94	19.06	7.83	0.000
Impulsivity	17.29	7.17	19.24	7.60	20.97	7.91	0.177	20.14	8.09	22.67	7.95	25.53	9.25	0.006
Sociability	20.49	8.36	19.64	8.03	19.71	7.80	0.710	22.62	6.19	19.85	7.21	18.87	7.20	0.028
Resilience	18.13	7.27	15.80	8.29	15.92	7.23	0.140	16.93	8.03	12.61	7.78	15.40	8.21	0.004
Dominance	16.73	8.50	17.07	7.65	19.07	7.38	0.461	14.40	6.13	15.02	6.70	17.32	7.82	0.139
Inhibition	16.82	8.52	18.20	8.19	14.38	7.50	0.172	19.57	8.46	21.18	8.63	23.29	8.69	0.130
Openness	17.86	6.51	18.86	8.03	19.00	5.55	0.513	16.77	8.32	16.02	8.03	16.96	8.66	0.616
Coping at age 19/20														
Mastery	2.95	0.32	2.85	0.35	2.85	0.41	0.058	3.05	0.39	2.88	0.35	2.80	0.38	0.000
Self-esteem	3.07	0.34	3.05	0.34	3.16	0.37	0.230	3.15	0.41	3.07	0.40	2.96	0.42	0.017
Childhood problems														
Family	1.45	1.63	2.45	2.41	3.12	2.03	0.005	1.46	2.02	2.68	2.40	3.82	2.67	0.000
Conduct	0.62	1.10	0.81	1.26	1.85	1.60	0.001	0.22	0.74	0.32	0.85	0.94	1.48	0.000

rejected by peers and sexual abuse; as adults, living alone, nervousness, impulsivity, depressiveness, low sociability, resilience and self-esteem.

Risk factors for suicidality by gender (multivariate associations)

The results are given in Tables 3 (women) and 4 (men). Here, it should be borne in mind that only 22 men but 50 women in our study attempted suicide. Moreover, the numbers were further reduced, because of the listwise exclusion from the multivariate analysis of cases with missing values. The resulting statistical power for suicide attempts in men was therefore insufficient and the analysis was omitted. For women, the final model was statistically highly significant ($\chi^2 = 91.10$, $df = 34$, $p < 0.001$) and the proportion of total variance was 42.2 %, which is very considerable.

In women, the most important risk factors for *suicidal ideation* were a low level of social support (OR 4.01), low mastery (OR 3.13) and the childhood experiences of being more often punished (OR 3.70) and of a broken home (OR 3.11), whereas in men, the main risk factors were personality traits: depressive (OR 6.49) and anxious (OR 4.59).

By far, the strongest risk factors for *suicide attempts* in women were a broken home (OR 10.19) and sexual abuse/violence in childhood (OR 7.94).

Discussion

Suicide attempts are known to be more prevalent among women and suicides more common among men in Western countries [2, 3], although in some parts of Asia, women's suicide rates were found to equal or exceed those of men [22]. Our results are in line with such findings, showing higher prevalence rates of suicide attempts among women (8.1 %) than men (5.1 %), whereas the rates for suicidal ideation were almost identical (42.2 vs. 38.8 %). A recent study of Muheim et al. [23] also found nearly twice as many suicide attempts in women than in men with a peak between ages 20–24 years. Our prevalence rate of 6.6 % for suicide attempts (women and men) ranks between the 4.1 % found in the NCS-A study of adolescents in the USA

Table 3 Multivariate associations in women. No suicidality ($N = 48$) is the reference category

	Predictor	OR (95 % CI)	Sig
Suicidal ideation ($N = 108$)	Broken home ($N = 34$)	3.11 (0.75; 12.87)	0.118
	Discipline problems at school ($N = 18$)	0.61 (0.12; 3.25)	0.565
	Disliked/rejected by peers ($N = 39$)	1.71 (0.40; 7.27)	0.467
	Frequent parental conflicts ($N = 57$)	1.75 (0.50; 6.13)	0.383
	More punished than peers ($N = 41$)	3.70 (0.73; 18.71)	0.113
	Sexual abuse/violence ($N = 46$)	1.93 (0.57; 6.62)	0.294
	Tense family atmosphere ($N = 51$)	0.63 (0.16; 2.43)	0.503
	Cyclothymic personality ($N = 54$)	1.57 (0.57; 4.28)	0.380
	Anxious personality ($N = 31$)	2.35 (0.62; 8.90)	0.208
	Depressive personality ($N = 30$)	1.30 (0.23; 7.24)	0.768
	Low social support ($N = 40$)	4.01 (0.91; 17.67)	0.067
	Separated/divorced/widowed ($N = 64$)	1.35 (0.54; 3.41)	0.521
	Low education level ($N = 66$)	1.91 (0.63; 5.78)	0.250
	Low sense of mastery ($N = 98$)	3.13 (1.30; 7.53)	0.011
Suicide attempt ($N = 44$)	Broken home ($N = 34$)	10.19 (2.00; 51.92)	0.005
	Discipline problems at school ($N = 18$)	1.07 (0.17; 6.93)	0.945
	Disliked/rejected by peers ($N = 39$)	2.67 (0.54; 13.34)	0.231
	Frequent parental conflicts ($N = 57$)	1.51 (0.34; 6.64)	0.588
	More punished than peers ($N = 41$)	5.30 (0.91; 30.98)	0.064
	Sexual abuse/violence ($N = 46$)	7.94 (1.97; 31.95)	0.004
	Tense family atmosphere ($N = 51$)	0.52 (0.09; 2.85)	0.448
	Cyclothymic personality ($N = 54$)	0.96 (0.27; 3.41)	0.950
	Anxious personality ($N = 31$)	0.79 (0.14; 4.43)	0.787
	Depressive personality ($N = 30$)	4.82 (0.75; 31.13)	0.098
	Low social support ($N = 40$)	4.30 (0.71; 25.99)	0.112
	Separated/divorced/widowed ($N = 64$)	1.95 (0.60; 6.40)	0.269
	Low education level ($N = 66$)	5.39 (1.22; 23.79)	0.026
	Low sense of mastery ($N = 98$)	4.68 (1.50; 14.64)	0.008

[24] and the 8.2 % reported among 36,757 17-year-olds in France [25]. Nevertheless, the comparability of those rates is limited because our study assessed not only suicidality during adolescence, but also during adulthood up to the age of 50. Our study, which started when the participants were 19/20 years old, yielded the important finding that most first suicide attempts occurred before the age of 20 in women, although not in men; in adulthood, many such attempts may not be recalled (forgetting, reluctance to report). This underscores the need for research into the risk factors for suicidality to focus on childhood and adolescence; unfortunately, our study can provide only retrospective information, collected in early adulthood, about this period of the participants' lives.

Findings in adolescents based on the prospective assessments of the more recent Zurich Longitudinal Study (ZAPPS) have indicated that suicidal risks may be seen as an expression of specific developmental tasks and changes, and a heightened risk of adjustment problems during adolescence that slowly abate with successful coping with these developmental tasks at the beginning of adulthood. The subjects characterized by suicidal risk at any of three times during adolescence were clearly more abnormal in their emotional and behavioural functioning than the matched controls without suicidal ideation. Other findings in the suicidal risk groups, such as a higher frequency and greater negative impact of life events, lower self-esteem, deficits in active coping and perceived greater parental rejection, formed a consistent pattern over time which did not prove but did suggest that these associations were causal [6]. Furthermore, a related analysis of the ZAPPS data showed an apparent heightened risk of abnormal psychosocial and psychopathological functioning for young adults with enduring suicidal ideation since adolescence and concomitant suicidal ideation in young adulthood, and for those who experienced suicidal ideation in particular in preadolescence [7].

In the Zurich study, both bivariate and multivariate analyses provided ample evidence of the importance of the first 20 years of life. The bivariate analyses revealed associations between certain early experiences and suicidal ideation and suicide attempts; these were in childhood a

Table 4 Multivariate associations in men

	Predictor	OR (95 % CI)	Sig
Suicidal ideation ($N = 101$)	Frequent parental conflicts ($N = 43$)	1.03 (0.37; 2.92)	0.949
	More punished than peers($N = 25$)	2.72 (0.70; 10.57)	0.147
	Restless in class (52)	2.52 (1.06; 5.99)	0.036
	Tense family atmosphere ($N = 44$)	1.59 (0.55; 4.59)	0.394
	Cyclothymic personality ($N = 36$)	2.43 (0.85; 6.96)	0.099
	Anxious personality ($N = 24$)	4.59 (0.94; 22.36)	0.059
	Depressive personality ($N = 17$)	6.49 (0.76; 55.57)	0.088
	Low social support ($N = 24$)	1.94 (0.50; 7.47)	0.338
	Low sense of mastery ($N = 96$)	1.37 (0.65; 2.89)	0.414

No suicidality ($N = 55$) is the reference category

Suicide attempt was excluded from the analysis because there were not enough cases ($N = 16$) to achieve acceptable statistical power

tense family atmosphere, childhood family and conduct problems, a family history of suicidality and, as assessed at age 20, personality traits and levels of social support and coping resources. Among women who had attempted suicide, we found particularly frequent experience of a broken home and sexual abuse in childhood. Three behavioural items were significantly more frequent among men who had attempted suicide: discipline problems at school, being more punished than peers and being restless in class. Since restlessness in class may well be related to an increased risk of attention deficit hyperactivity disorder (ADHD), it would be of interest to further explore potential association of ADHD, or certain symptom clusters thereof, with suicidality. Unfortunately, however, we did not collect any specific data on ADHD.

Multivariate analyses of the risk factors for suicidality should focus on, rather than merely control for, gender differences, as has been shown by research on risk factors in child and adolescent psychiatry [6, 26]. Childhood adversity and high levels of depression or anxiety have both been shown to predict suicidality at 4-year follow-up [27]. With the present study, we are able to demonstrate that there are also gender-dependent effects. As with the bivariate analysis, suicide attempts in women were found to be principally associated with a broken home and sexual abuse/violence in childhood. Our findings on sexual abuse/violence are compatible with several studies: the review findings of Devries and Seguin [28] and the study of Brezo et al. [29] on child abuse in a large cohort of school children, the community study of Mullen et al. [30], the review of Santa Mina et al. [31], studies on bipolar patients [32–34] and on substance-dependent patients [35] and, lastly, the twin study of Kendler et al. [36], who found that all psychiatric disorders were associated with sexual abuse. Sexual trauma is common among women, as shown by a large investigation of sexually experienced American young women, where the prevalence rate of childhood sexual abuse (CSA) was 4.6 % [37] and is more frequent among women than men [38]. In a large, nationally representative sample of 9th grade students in Switzerland, 40.2 % of girls reported having experienced at least one type of CSA event. Lifetime prevalence was 35.1 % for "CSA without physical contact"; 14.9 % for "CSA with physical contact without penetration"; and 2.5 % for "CSA with penetration" [39]. The mechanism whereby sexual trauma leads to suicidality seems to lie in its magnification of the concurrent experience of other forms of childhood maltreatment [37]; however, the effect of sexual trauma has also been shown to be attenuated by controlling for affective symptoms [38] and parental psychopathology [40, 41]. Moreover, with respect to personality disorders, it has been shown that if sexual abuse was multivariately adjusted for other forms of abuse—in particular, emotional abuse and neglect—its detrimental impact became negligible [42–44]. The lower mastery of suicidal women at the age of 20, which may play a role in coping with life stressors, could already be a consequence of earlier adversity, especially sexual abuse, which is very common in women.

Suicide attempts were less frequent among men, but we were unfortunately unable to conduct multivariate inferential analyses because the small case numbers resulted in inappropriately low statistical power. Finally, our study showed that suicide attempts declined with age. This finding accords with the literature: for example, a longitudinal study over a briefer period of 4 years reported a similar decrease in the rates of suicidal ideation and suicide attempts [27]. Similarly, in an Australian cross-sectional study, higher suicidality rates were found in the younger age group in the preceding 12 months [45]. A systematic age-related decrease in suicide attempts and increase in suicides was consistently found among adults in Germany [46].

Conclusions

Overall, suicidality among women seems to be more commonly associated with childhood environmental risk factors (broken home and sexual abuse), while in men,

certain personality traits (depressive and anxious) play an important role, particularly in suicidal ideation. Our findings strongly suggest that the risk factors for suicidality should be analysed separately for men and women, rather than merely controlled for gender.

Limitations

The sample size ($N = 591$ at study outset and $N = 335$ at final assessment) was limited; low cell frequencies, especially in men attempting suicide ($N = 24$), may have blurred differences. The multivariate inferential analysis of suicide attempts in men was therefore omitted. The statistical power of the multivariate analyses was generally low (also in women), which resulted in rather uncertain estimates. This uncertainty is expressed by wide confidence intervals of the effect sizes; those results should therefore be interpreted with caution. In addition, the number of subjects attempting suicide who could be assigned to particular interview years was low, so that only a cumulative lifetime occurrence of suicide attempts was considered for the analysis. Although the study was longitudinal in its nature, the associations are only correlational, because no exact temporal order could be determined. The study does not deal with completed suicides.

Conflict of interest None.

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